WHAT IS CLAIMED IS:

1. A plasma processing method for performing film formation, etching, surface treatment or the like on a substrate by supplying high frequency power between an electrode and a holder, by which the substrate is supported to be opposed to the electrode, to generate plasma between the electrode and the substrate on the basis of a plasma processing gas,

wherein pressure P(Torr) of the plasma processing gas is set to satisfy the following relationship

$$2\times10^{-7}(\text{Torr/Hz})\times f(\text{Hz})\leq P(\text{Torr})\leq 500(\text{Torr})$$

where f(Hz) is a frequency of the high frequency power.

2. The plasma processing method according to claim 1, wherein the plasma processing gas is a mixture gas of a reactant gas and an inert gas.

3. The plasma processing method according to claim 1, wherein the pressure P(Torr) of the plasma processing gas is set to a pressure near a lower limit of a range which is within a range described in claim 1 and, in which the plasma can be maintained stable.

4. The plasma processing method according to claim 2, wherein the pressure P(Torr) of the plasma processing gas is set to satisfy the following relationship

$$5\times P_r(\text{Torr})\leq P(\text{Torr})$$

where Pr(Torr) is partial pressure of the reactant gas.

5. The plasma processing method according to claim 2, wherein the pressure P(Torr) of the plasma processing gas is set to satisfy the

following relationship

$$P(Torr) \leq 3.5 \times P_L(Torr)$$

where the pressure $P_L(Torr)$ is a higher one of a pressure represented by a relationship

$$P_L(Torr) = 5 \times Pr(Torr)$$

and a pressure represented by a relationship

$$P_L(Torr) = 2 \times 10^{-7}(Torr/Hz) \times f(Hz)$$

where f(Hz) is a frequency of the high frequency power and Pr(Torr) is a partial pressure of the reactant gas.

6. The plasma processing method according to claim 1, wherein the frequency f(Hz) of the high frequency power is at least 10MHz and at most 500MHz, and the pressure P(Torr) of the plasma processing gas is at least 100Torr and at most 500Torr.

7. The plasma processing method according to claim 2, wherein the inert gas is a He gas.

8. The plasma processing method according to one of claims 1 to 7, wherein the plasma processing method is one for performing film forming processing on a substrate.